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(54) Kitchen unit cooking stove having internal cooling system.

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Description

The present invention relates to a cooking stove which is removably mountable within an opening cut in a table top board forming part of a kitchen unit, and in particular to a cooking stove of this type which employs high-frequency induction heating.

In the prior art, such a cooking stove generally has two or more heater elements, e.g. with each heater element including an induction heating coil. In order to prevent excessive internal temperature rise within the interior of the cooking stove, comparatively complex internal cooling arrangements are necessary in order to remove heat which is dissipated by the heating elements. Since the positions of components of the internal cooling system are fixed, it is difficult to vary the positions of the heater elements, and it is necessary to provide large ventilation apertures in the cooking stove and in the kitchen unit itself, in order to ensure a sufficiently high cooling capacity. In addition, also due to the fact that the positions of the components of the cooling system are fixed, it is difficult to increase the number of heater elements in a simple manner.

WO 83/03735 discloses a cooking stove with an apertured chassis supporting a heater element and a fan which drives air through the chassis and through an air inlet/outlet section of the stove.

It is an aim of the present invention to provide an improved cooking stove of this general type.

According to the present invention there is provided a cooking stove comprising a case having a cooling air inlet/outlet section formed therein, a top plate mounted on an upper part of said case, formed with a flat upper surface for use as a cooking surface, a ventilation duct member mounted within said case and communicating with said cooling air inlet/outlet section and having a ventilation aperture formed through an upper face thereof, and an internal chassis mounted within said case upon said ventilation duct member, said chassis having an aperture communicating with said ventilation aperture, a heater element mounted on an upper side of the chassis below said cooking surface of said top plate, and a cooling fan for drawing a flow of cooling air through said chassis and said chassis aperture and said ventilation duct and through said cooling air inlet/outlet section;

characterised in that there are at least two said internal chassis mounted within said case upon said ventilation duct member, each said chassis being formed independently of said case and ventilation duct member and having a hollow rectangular configuration with a top, a bottom and two sides and two substantially open opposing ends, and each chassis having a chassis aperture formed in the bottom and positioned substantially centrally in said bottom and communicating said ventilation aperture in said upper face of said ventilation duct member, and in that there are two of said heater elements mounted on the top of said internal chassis, with one of said two heater elements positioned adjacent each of said open opposing ends of said internal chassis, and in that respective ones of said cooling fans are mounted within each internal chassis adjacent said chassis aperture in said bottom thereof, for drawing said flow of cooling air through said opposing open ends and outward through said chassis aperture thereof into said ventilation duct, and in that at least one partitioning member is mounted in the interior of said ventilation duct member for separating flows of cooling air from respective ones of said two internal chassis.

In the case of a cooking stove employing high frequency induction heating, the electronic components which drive each of the heater elements can be conveniently mounted in the interior of the corresponding internal chassis, and effectively cooled by the flow of air through the chassis interior.

With such a cooling system, the internal configuration of the cooling stove can be made extremely simple and inexpensive to manufacture.

In order that the invention may be more clearly understood, the following description is given, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is an oblique view of an embodiment of a cooking stove according to the present invention which is fitted into a table top board of a kitchen unit;

Figure 2 is a cross-sectional view taken along line A—A' in Figure 1;

Figure 3 is a cross-sectional view taken along line B—B' in Figure 1;

Figure 4 is an oblique view of the interior of a cooking stove;

Figure 5 is an oblique view to illustrate the configuration of the ventilation ducts;

Figure 6 is an oblique view to show the configuration of an internal chassis;

Figure 7 is an oblique view to show partitioning of the ventilation ducts, and;

Figure 8 is a cross-sectional view to show a "short-circuit" air flow condition of the internal chassis ventilation system.

Referring to Figure 1, reference numeral 1 denotes a top member of a kitchen unit, having a flat upper surface which can be utilized for example as a drainboard or for cooking operations. This top member of the kitchen unit will be referred to in the following as a table top board. Reference numeral 2 denotes an embodiment of a cooking stove according to the present invention, which is removably fitted into an opening 3 formed in the table top board 1. Numeral 4 denotes a top plate of cooking stove 2, having an upper surface which serves as a cooking surface and which is supported by a frame 5. Reference numeral 6 denotes a back grill which is positioned at the rear of the top plate 4 and which has ventilation air inlet and outlet apertures formed therein as described hereinafter, which are utilized to pass a flow of cooling air through the interior of cooking stove 2. Numeral 7 denotes a

control panel, by which the user can adjust the level of electrical power supplied to each of the heater elements of the stove, and is preferably of touch-switch type.

Figure 2 is a cross-sectional view taken along line A—A' in Figure 1, and Figure 3 is a cross-sectional view taken along line B—B' while Figure 4 is an oblique view of the interior of cooking stove 2. In Figures 2, 3 and 4, reference numeral 8 denotes the case of cooking stove 2, and reference numeral 9 denotes a first internal chassis on top of which are mounted heater elements 10 and 11, while a second internal chassis 9', of identical configuration to first internal chassis 9, has heater elements 10' and 11' mounted thereon. In this embodiment, heater elements 10 and 11 employ high-frequency induction heating coils. Each of the internal chassis 9 and 9' is formed from sheet material and is shaped to be of hollow rectangular cross-section, leaving two open opposing sides, e.g. as designated by 9a and 9b, through which air can flow into the chassis interior. An aperture 12 is formed in the center of the base of the internal chassis 9, while a motor-driven cooling fan 13 is mounted in aperture 12 such as to produce a flow of cooling air therethrough, directed downward. Internal chassis 9' is similarly provided with a cooling fan 13', and lower aperture 12'. Numeral 6 denotes a back grill, through which cooling air passes into and out from the internal cooling system of cooking stove 2. Numeral 14 denotes a ventilation duct member having the shape of an inverted tray which has an open rear side, denoted as 14a, and which is mounted on the upper surface of the base of case 8. Circular apertures 15 and 16 are formed in the top of the ventilation duct member 14, positioned to receive cooling air flows from fans 13 and 13' respectively. Reference numeral 18 denotes a partitioning plate which is disposed at the rear of the case 8, and which serves to ensure that the exhaust air flowing through the ventilation duct member 14 will not be recirculated within the internal chassis 9 and 9', but will flow out through the back grill 6. Reference numerals 19 and 20 denote apertures which are formed in the partitioning plate 18, through which cooling air flows inward. Numerals 21 and 22 denote separation plates which serve to separate the air inlet and air outlet sections of back grill 6.

A cooling air inlet/outlet section is thereby constituted by partitioning plate 18 with apertures 19, 20 formed therein, separation plates 21, 22 and the rear side of case 8. All of the air flow which performs cooling of the interior of cooking stove 2 passes inward and outward through this cooling air inlet/outlet section, so that it is unnecessary to form any ventilation apertures in the kitchen unit containing cooking stove 2 for cooling purposes, or any additional ventilation apertures in case 8.

Figure 6 shows the interior of internal chassis 9 in greater detail, with the interior of internal chassis 9' being of course identical thereto. In Figure 6, numeral 23 denotes a heat dissipating power transistor, forming part of an electronic circuit which drives high-frequency induction heating elements 10 and 11. Reference numeral 24 denotes a circuit board on which are mounted other electronic components to control operation of the heater elements 9, 11. As shown in Figure 6, as a result of rotation of the cooling fans 13 of internal chassis 9, cooling air will flow through both of the side openings 9a, 9b into the interior of the chassis. After cooling the power transistor 23 and circuit board 24 this air flows out through the lower aperture 12.

The overall operation of the cooling system of this embodiment will now be described, referring to Figures 2, 3 and 4. When electrical power is supplied to any of the heater elements 10, 11, 10', 11' of the cooking stove 2, one or both of cooling fans 13 and 13' of internal chassis 9 and 9' will be set in operation. Cooling air will thereby flow through ventilation paths which include the interiors of internal chassis 9 and 9', i.e. air from the external atmosphere will be drawn into the inlet apertures 19 and 20 formed in partitioning plate 18, from the inlet sections of back grill 6, will then flow through the side apertures 9a, 9b, 9a', 9b' of internal chassis 9 and 9', and then through the lower apertures 12, 12' in these chassis past cooling fans 13, 13'. The air will then flow through ventilation duct 14 to be output through back grill 6. Due to this flow of cooling air, circuit components within the internal chassis 9 and 9' are cooled to a sufficient degree to ensure that the components will be maintained below a specific temperature. Also, due to the fact that each of the internal chassis 9, 9' has a "tunnel" configuration, i.e. is of hollow shape with a rectangular cross-section and openings at side faces thereof, the flow of ventilating air will be concentrated upon specific components which must be effectively cooled. Cooling of the internal components within the chassis 9 and 9' is thereby executed in a highly efficient manner.

With the embodiment of the present invention described hereinabove, independent cooling fans are provided for each of the internal chassis, so that highly effective cooling is attained. In addition, although only two internal chassis 9 and 9' are incorporated in the described embodiment it will be apparent that the number of internal chassis, and hence the number of heater elements, can be easily increased as required. This is due to the fact that the internal chassis are each of identical configuration and are arrayed successively adjacent to one another. Furthermore, it will be apparent that it is not necessary to form any apertures in the kitchen unit which accommodates the cooking stove, other than the opening 3 into which the cooking stove 2 is fitted. Thus, no machining of the kitchen unit is necessary, to provide for cooling of the cooking stove, so that installation of such a stove and the design of a kitchen unit to accommodate the stove are made extremely simple.

As shown in Figure 4, the internal chassis 9 and 9' of the described embodiment each are pro-

vided with two heater elements which differ in size, i.e. a small heater element 10 (10') and a large heater element 11 (11'), with the large and small heater elements being positioned in an angularly opposing relationship as shown in Figure 4. Such an arrangement serves to facilitate the positioning of cooking pans upon the top plate, and can be easily implemented with the described embodiment.

Furthermore, as shown in Figure 7, a partitioning plate 27 is mounted in the interior of the ventilation duct, in order to separate the ventilation air flows of the first internal chassis 9 and the second internal chassis 9'. In this way, in the event that only one of the cooling fans is set in operation, a "short-circuit" air flow bypass effect will be prevented. If partitioning plate 27 were not incorporated, a condition could occur in which air is continuously recirculated within the interior of the cooking stove as illustrated in Figure 8, thereby causing a rise in the internal temperature of the cooking stove. The partitioning plate 27 thus serves to enhance the effectiveness of the ventilation system.

As described in the above, with a configuration for a cooking stove according to the present invention, it is unnecessary to provide ventilation apertures in the exterior walls of the case of the cooking stove or in the kitchen unit within which the cooking stove is fitted. In addition, a plurality of heater elements can be easily provided wthin the cooking stove. Due to the use of separate internal chassis, each provided with an independent cooling fan and ventilation path, it is not necessary for any special consideration to be given to cooling of the cooking stove, when the stove is to be installed within a kitchen unit. Furthermore the design of a cooking stove according to the present invention is such that the number of heater elements can be easily increased. In addition, due to the use of independent heater units, assembly at the time of manufacture and changeover of units during servicing can be very easily carried out. Thus the present invention enables an extremely simple and low-cost cooking stove to be manufactured.

Claims

1. A cooking stove comprising a case (8) having a cooling air inlet/outlet section (18, 19, 20) formed therein, a top plate (1) mounted on an upper part of said case, formed with a flat upper surface for use as a cooking surface, a ventilation duct member (14) mounted within said case and communicating with said cooling air inlet/outlet section and having a ventilation aperture (15) formed through an upper face thereof, and an internal chassis mounted within said case upon said ventilation duct member, said chassis having an aperture communicating with said ventilation aperture, a heater element mounted on an upper side of the chassis below said cooking surface of said top plate, and a cooling fan for drawing a flow of cooling air through said chassis and said chassis aperture and said ventilation duct and through said cooling air inlet/outlet section;

characterised in that there are at least two said internal chassis (9, 9') mounted within said case upon said ventilation duct member, each said chassis being formed independently of said case and ventilation duct member and having a hollow rectangular configuration with a top, bottom and two sides and two substantially open opposing ends, and each chassis having a chassis aperture (12, 12') formed in the bottom and positioned substantially centrally in said bottom and communicating with said ventilation aperture in said upper face of said ventilation duct member, and in that there are two of said heater elements (10, 11) mounted on the top of said internal chassis, with one of said two heater elements positioned adjacent each of said open opposing ends of said internal chassis, and in that respective ones of said cooling fans (13, 13') are mounted within each internal chassis adjacent said chassis aperture in said bottom thereof, for drawing said flow of cooling air through said opposing open ends and outward through said chassis aperture thereof into said ventilation duct, and in that at least one partitioning member (27) is mounted in the interior of said ventilation duct member for separating flows of cooling air from respective ones of said two internal chassis.

2. A cooking stove according to Claim 1, in which said two heater elements of each said chassis comprise one small heater element and one large heater element and in which the small heater elements and large heater elements of said two chassis are positioned in a mutually opposing angular relationship.

Patentansprüche

1. Kochherd mit einem Gehäuse (8), das mit einer darin ausgebildeten Kühlluft-Ein-/Auslaßsektion (18, 19, 20) ausgestattet ist, mit einer oberen Platte (1), die an einem oberen Teil des Gehäuses gehalten und mit einer ebenen Oberfläche zur Verwendung als eine Kochfläche versehen ist, mit einem innerhalb des Gehäuses montierten Belüftungskanal-Bauteil (14), das mit der Kühlluft-Ein-/Auslaßsektion in Verbindung steht sowie eine durch eine obere Fläche von diesem hindurch ausgebildete Belüftungsöffnung (15) hat, und mit einem innerhalb des Gehäuses auf dem Belüftungskanal-Bauteil angebrachten inneren Baurahmen, der eine mit der Belüftungsöffnung in Verbindung stehende Öffnung, ein an einer oberen Seite des Baurahmens unterhalb der Kochfläche der oberen Platte befestigtes Heizelement sowie ein Kühlgebläse, das einen Strom von Kühlluft durch den Baurahmen sowie die Baurahmenöffnung und den Belüftungskanal sowie durch die Kühlluft-Ein-/Auslaßsektion zieht, umfaßt, dadurch gekennzeichnet, daß wenigstens zwei innere Baurahmen (9, 9') innerhalb des Gehäuses auf dem Belüftungskanal-Bauteil angebracht sind, daß jeder dieser Baurahmen unabhängig von dem Gehäuse sowie dem Belüftungs-

kanal-Bauteil ausgebildet ist und eine hohle, rechteckige Gestalt mit einer oberen Fläche, mit einer unteren Fläche und mip zwei Seitenflächen sowie mit zwei im wesentlichen offenen, einander gegenüberliegenden Stirnflächen hat, daß jeder Baurahmen eine in der Bodenfläche ausgebildete sowie in wentlichen zentral in dieser Bodenfläche angeordnete und mit der Belüftungsöffnung in der oberen Fläche des Belüftungskanal-Bauteils in Verbindung stehende Baurahmen-Öffnung (12, 12') aufweist, daß auf der Oberfläche des inneren Baurahmens zwei der Heizelemente (10, 11) angebracht sind, wobei eines der beiden Heizelemente nahe jeder der offenen, gegenüberliegenden Stirnseiten des inneren Baurahmens angeordnet ist, daß jeweils eines der Kühlgebläse (13, 13') innerhalb jedes inneren Baurahmens benachbart zur Baurahmen-Öffnung in dessen Bodenfläche montiert ist, um den Kühlluftstrom durch die gegenüberliegenden, offenen Stirnseiten sowie nach außen durch die Baurahmen-Öffnung in den Belüftungskanal zu ziehen, und daß wenigstens ein Trennwandelement (27) in das Innere des Belüftungskanal-Bauteils eingebaut ist, um die Kühlluftströme von jeweils einem der beiden inneren Baurahmen auseinanderzuhalten.

2. Kochherd nach Anspruch 1, dadurch gekennzeichnet, daß die beiden Heizelemente eines jeden der Baurahmen eine kleines Heizelement sowie ein großes Heizelement umfassen und daß die kleinen Heizelemente sowie dei großen Heizelemente der beiden Baurahmen in einer wechselseitig entgegengesetzten Winkel-Lagebeziehung angeordnet sind.

Revendications

1. Cuisinière comprenant une caisse (8) avec une section (18, 19, 20) d'entrée/sortie d'air de refroidissement installée à l'intérieure, une plaque supérieure (4) montée sur la partie supérieure de ladite caisse, façonnée pour avoir une surface supérieure plate servant de surface de cuisson, un élément de conduit de ventilation (14) monté à l'intérieure de ladite caisse et communiquant avec ladite section d'entrée/sortie d'air de refroidissement et ayant une ouverture de ventilation (15) pratiquée dans sa face supérieure, et un châssis intérieure monté dans ladite caisse sur ledit élément de conduit de ventilation, ledit châssis ayant une ouverture communiquant avec ladite ouverture de ventilation, un élément de chauffage installé sur la face supérieure dudit châssis sous ladite surface de cuisson de ladite plaque supérieure, et un ventilateur de refroidissement pour aspirer un flux d'air de refroidissement par ledit châssis et ladite ouverture du châssis et ledit conduit de ventilation et par ladite section de refrodissement d'entrée/sortie d'air; caractérisée par le fait qu'il existe au moins deux desdits châssis intérieurs (9, 9') montés dans ladite caisse sur ledit élément de conduit de ventilation, chacun desdits châssis étant construit séparément de ladite caisse et dudit élément de conduit de ventilation et ayant une configuration rectangulaire creuse avec une dessus, un fond et deux côtés ainsi que deux extrémités opposées largement ouvertes, et chaque châssis ayant une ouverture de châssis (12, 12') pratiquée dans le fond et située pratiquement au centre dudit fond et communiquant avec ladite ouverture de ventilation de ladite face supérieure dudit élément de conduit de ventilation, et par le fait que deux desdits éléments de chauffage (10, 11) sont installés sur le dessus dudit châssis intérieur, avec un desdits éléments de chauffage placé au voisinage de chacune des dites extrémités ouvertes dudit châssis intérieure, et par le fait que lesdits ventilateurs de refroidissement (13, 13') sont montés respectivement dans chaque chassis intérieure de façon contiguë à l'ouverture de châssis dudit fond de ce dernier, pour aspirer ledit flux d'air de refroidissement par lesdites faces d'extrémités ouvertesopposées et l'expulser par ladite ouverture de châssis dans ledit conduit de ventilation, et par le fait qu'au moins une cloison de séparation (27) est installée à l'intérieur de l'élément de conduit de ventilation pour séparer les flux d'air de refroidissement provenant respectivement d'un desdits deux châssis intérieurs.

2. Cuisinère selon la revendication 1, dans laquelle lesdits deux éléments de chauffage de chacun desdits châssis comprennent un petit élément de chauffage et un grand élément de chauffage, et dans laquelle le petit élément de chauffage et le grand élément de chauffage desdits deux châssis sont placés sur les châssis l'un par rapport à l'autre selon une disposition angulaire opposée.

FIG. 1

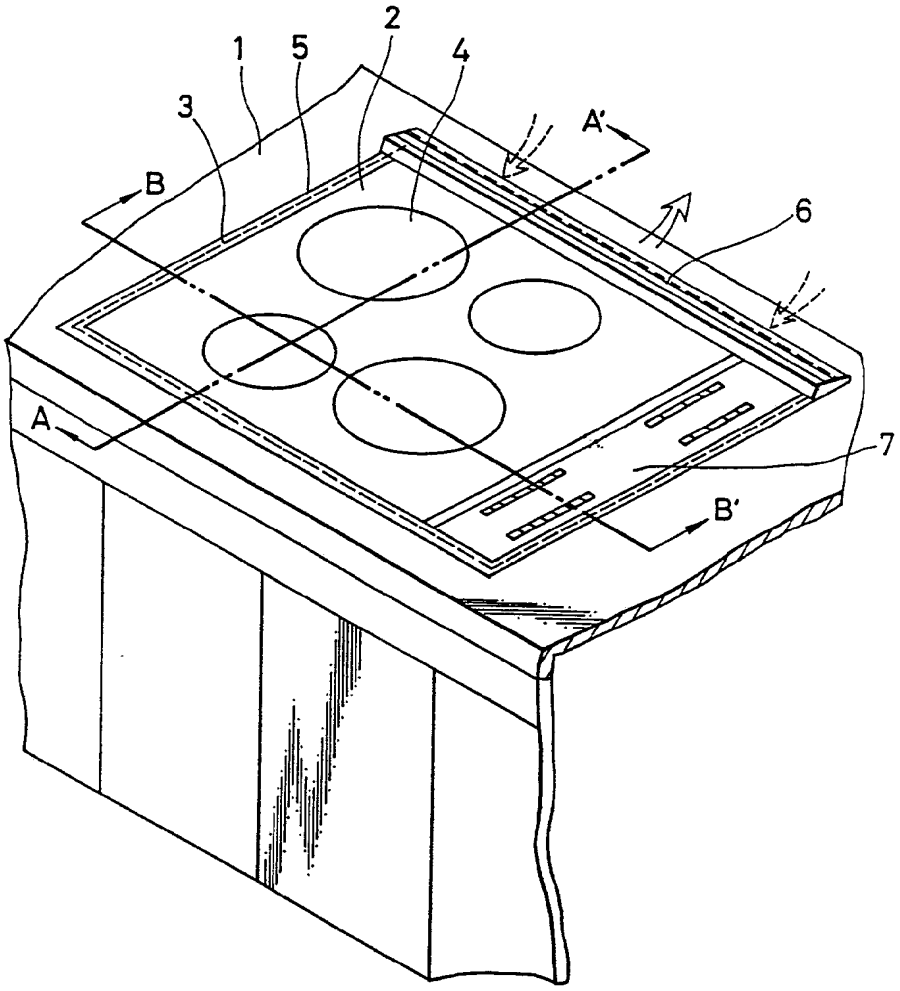

FIG. 2

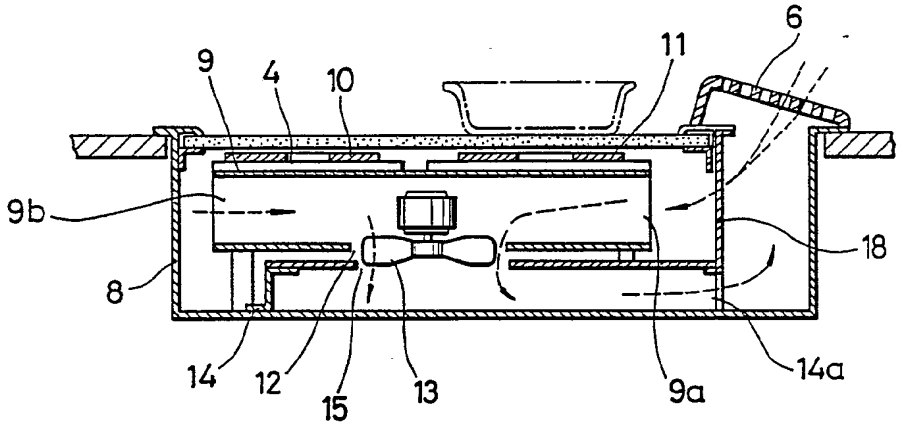

FIG. 3

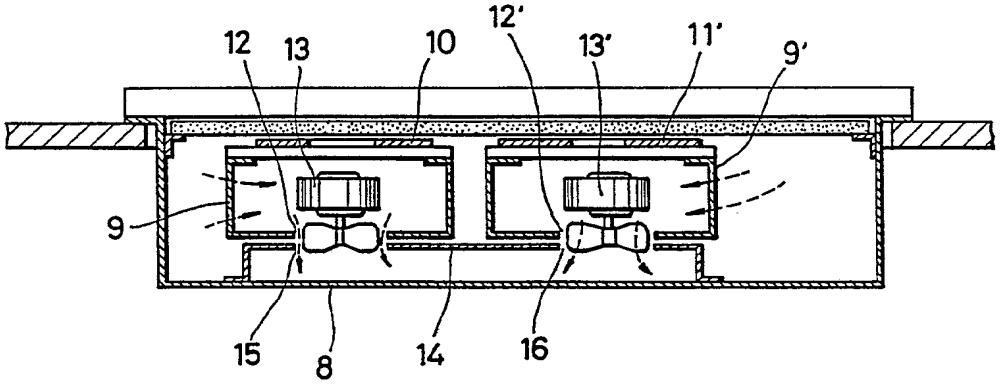

FIG. 4

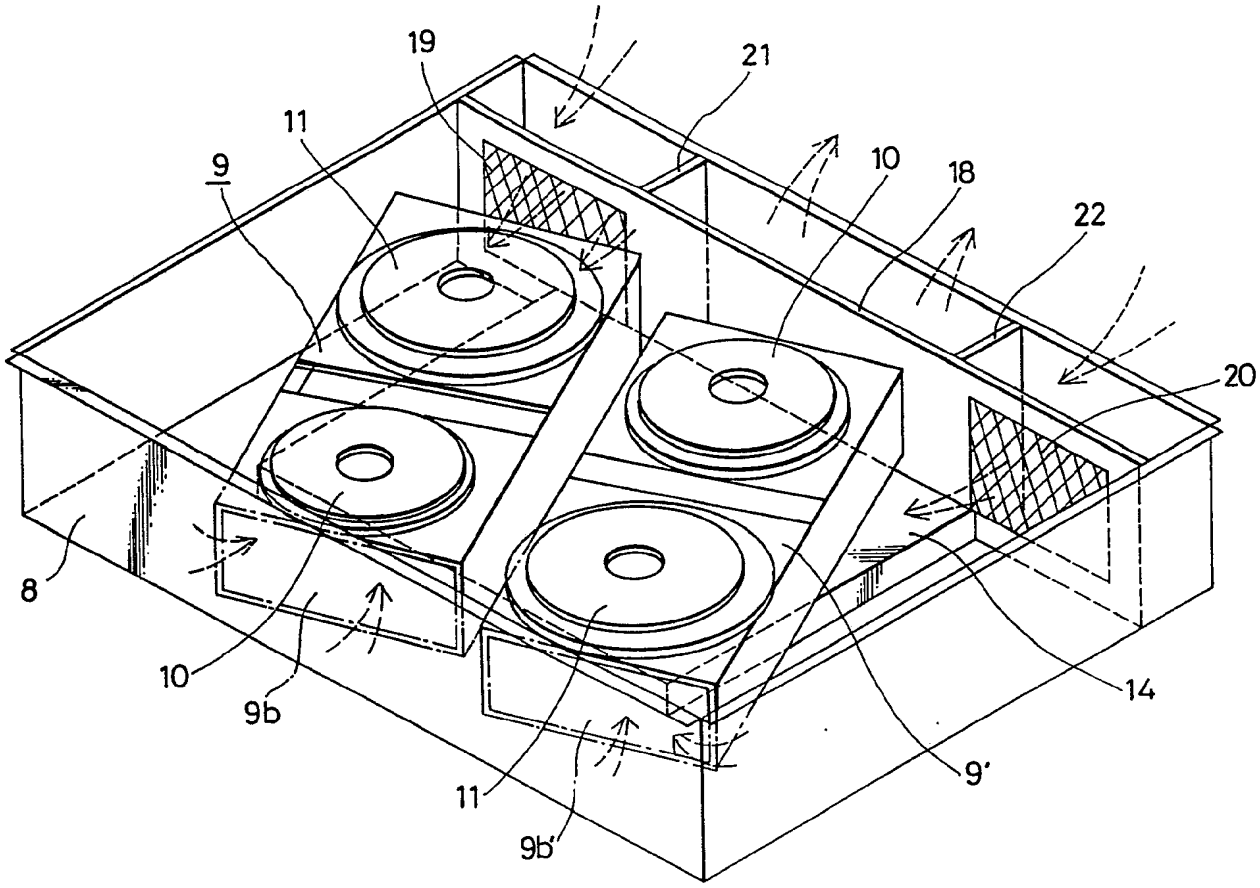

FIG. 5

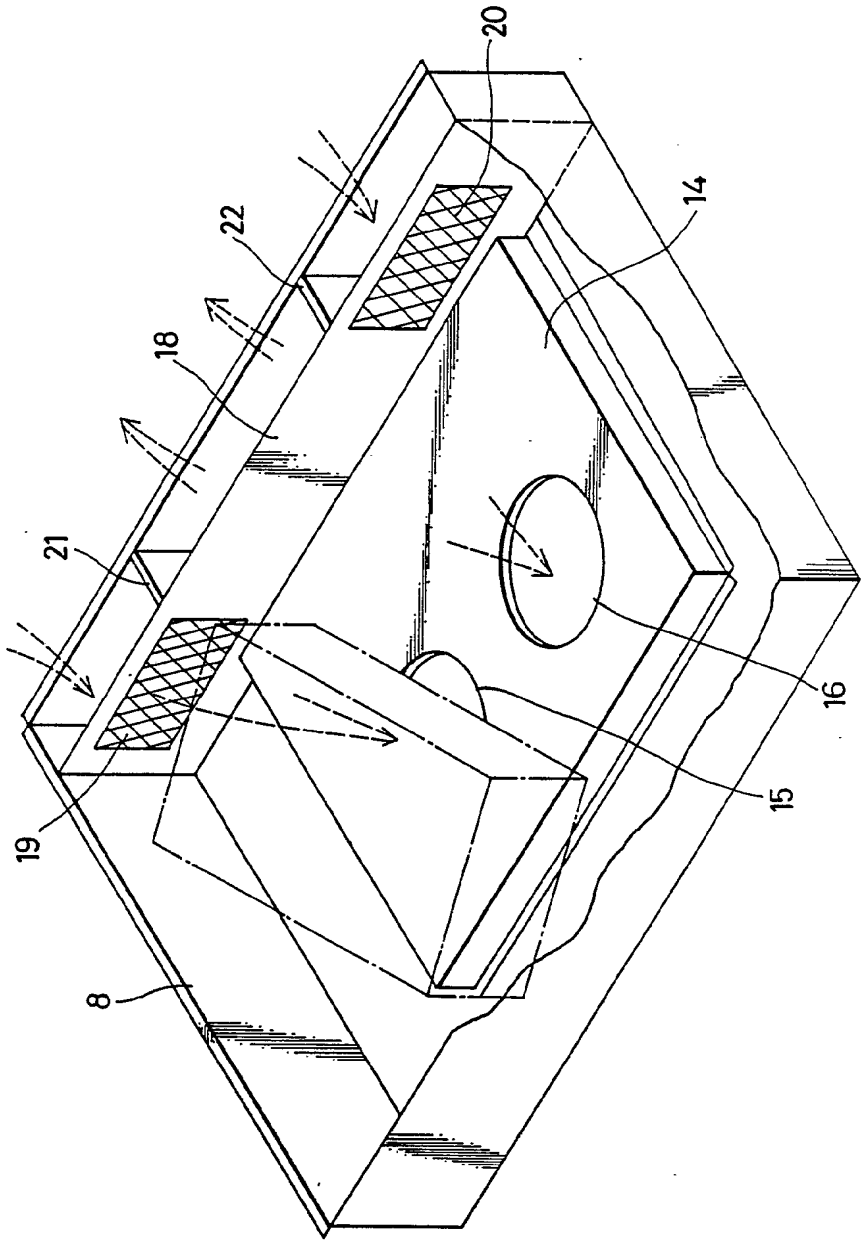

FIG. 6

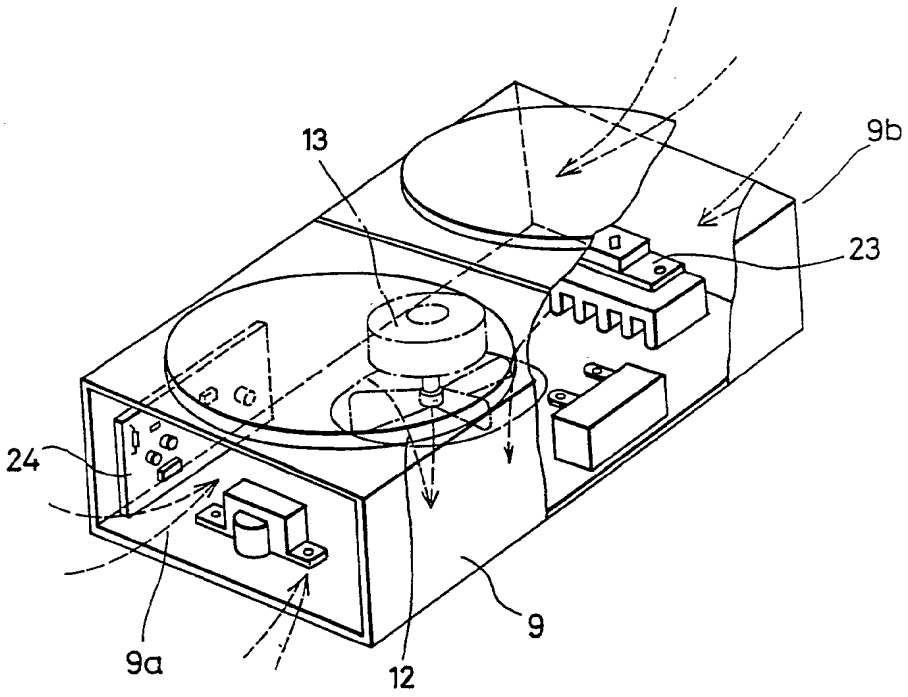

FIG. 7

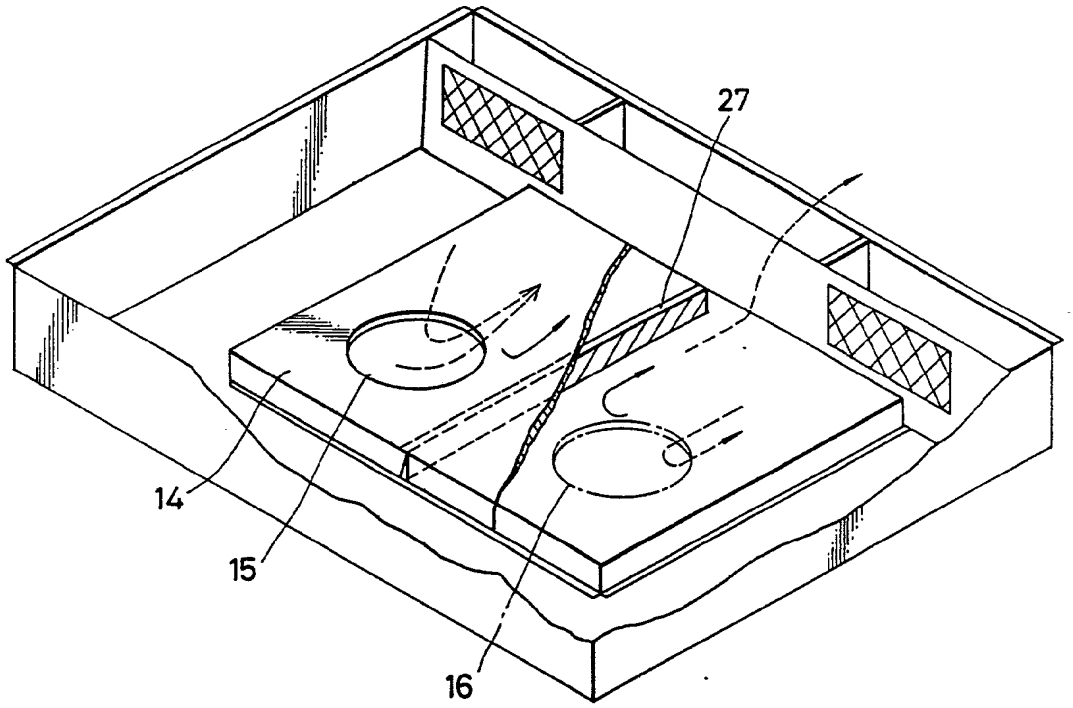

FIG. 8